

Earth Processes Along the C&O Canal

Curricular Connection



2.0 Earth/Space Science – Students will use scientific skills and processes to explain the chemical and physical interactions (i.e., natural forces and cycles, transfer of energy) of the environment, Earth, and the universe that occur over time.

A. Materials and Processes That Shape A Planet

2. Cite and describe the processes that cause rapid or slow changes in Earth's surface.

- a. Identify and describe events such as tornadoes, hurricanes, volcanic eruptions, earthquakes, and flooding which change surface features rapidly.
- b. Recognize that the natural force of gravity causes changes in Earth's surface features as it pulls things toward Earth, as in mud and rock slides, avalanches, etc.
- c. Cite examples that demonstrate how the natural agents of wind, water, and ice produce slow changes on the Earth's surface such as carving out deep canyons and building up sand dunes.

3. Explain how rock is formed from combinations of different minerals and that smaller rocks come from the breakage and weathering of bedrock (solid rock underlying soil components) and larger rocks; soil is made partly from weathered rock, partly from plant remains-and also contains many living organisms.

c. Describe ways that the following processes contribute to changes always occurring to the Earth's surface.

- Weathering
- Erosion
- Deposition

6.0 Environmental Science: Students will use scientific skills and processes to explain the interactions of environmental factors (living and non-living) and analyze their impact from a local to a global perspective.

B. Environmental Issues

2. Recognize and describe that consequences may occur when Earth's natural resources are used.

a. Explain how human activities may have positive consequences on the natural environment.

- Recycling centers
- Native plantings
- Good farming practice

Background



Earth's surface features can change rapidly during brief violent events such as earthquakes, tornadoes, hurricanes, floods, and volcanic eruptions. These natural processes can reshape the Earth's surface in a matter of minutes, hours, or days.

Weathering and erosion by wind, water and ice are very slow processes which reshape the Earth's surface over millions of years. The Grand Canyon in the Southwest United States was carved by the action of moving water in the Colorado River. The Great Sand Dunes in Colorado were formed by the action of winds blowing sand from dry lake beds. The sand from these beds was originally part of the surrounding mountains that was eroded and deposited as sediment during flooding. Wind erosion and sand deposition interact continuously to change the size of the dunes. The slow movement of glaciers over thousands of years produced the mountains and deep valleys in Yosemite Park, California. The steep sides and rounded bottoms of the fjords along the coast of Norway were also carved out by the action of glaciers.

Weathering is the process of breaking down rocks into smaller particles near the surface of the Earth by the effects of water, ice and wind. Weathering is part of the rock cycle. Soil and sediment consist of weathered rock and decomposed organic materials from dead animals and plants.

Water can expand and contract with wetting and drying. Air in water that is drawn into cracks in rocks and soil can exert pressure when the water moves to a different place. Water may enter a crack in a rock, freeze and push the rock apart. This process is most common in mountainous regions with cold temperatures and plentiful precipitation. It may take many cycles of freezing and thawing to complete the fracture of the rock.

Weathering by wind occurs when rocks are exposed to wind-driven particles. The surface of the rock is gradually worn down by the abrasive force of the particles.

Erosion is the carrying away of weathered rocks by water, wind, ice or gravity. Erosion loosens and carries away rock debris formed by weathering. Rain, wind, moving water, cold and hot temperatures, and ice cause the crust to break up into smaller pieces and be deposited in other areas.

Water is the strongest agent of erosion. Erosion from water can occur when the amount of precipitation is greater than the ability of the soil to retain water. Erosion by water can also occur in coastal areas through the action of waves against the shore. Erosion transports particles to a new location.

Erosion by ice occurs when glaciers move due to gravity or by melting. As glaciers move they can move rock fragments or erode entire mountain sides or carve valleys.

Weathered particles from mountains are deposited by wind erosion in other areas to form sand dunes.

Resource: mdk12.org

Materials/ Resources



Teacher Materials

- Binder with lesson materials (pictures of flooding, signs, etc.)




Student Materials



- Clipboards (6)
- Pencils
- Observation sheets





Safety



- Students are to watch for cars and bikes when crossing the parking lot.
- Students are to use caution around water areas.
- Students should not wade into the water. Students should remain on the shore at all times.
- Students are not to walk on logs that have fallen into the water.
- Students should not handle living things, plants or animals, unless directed to do so by a teacher.

<p>Focus Question</p> 	<p>Focus Question</p> <ul style="list-style-type: none"> How do the processes of weathering, erosion, and deposition contribute to the rapid and slow changes along the C&O Canal?
<p>Vocabulary</p> 	<p>biological weathering – Weathering caused by plants and animals. Plants and animals release acid forming chemicals that cause chemical weathering and also contribute to the breaking down of rocks and landforms.</p> <p>chemical weathering – Weathering caused by breaking down of rocks and landforms. The most common agent of chemical weathering is rainwater. Chemical weathering, such as acid rain, eats away at certain types of rocks such as limestone, creating cracks and holes.</p> <p>deposition – the process by which sediments are deposited in a new location</p> <p>erosion – the carrying away of weathered soil, rock, and other materials on the Earth's surface by gravity, water, ice, and wind.</p> <p>deposition – the process by which sediments are deposited in a new location</p> <p>mechanical weathering – Weathering caused by the breaking down of rocks by physical force without any change in the chemical nature of the rocks. Mechanical weathering is usually caused by extreme hot and cold temperatures. Water seeps into cracks in rocks, freezes, and expands, causing further breakdown of rocks. Wind is another example of mechanical weathering. Wind can move sand from one place to another or blow it against hard surfaces rubbing away at them like sandpaper.</p> <p>natural agents – water, wind, and ice</p> <p>sediment - small pieces of rock, shell, and plant and animal matter that is moved and deposited by water, wind, or ice</p>
<p>Pre-Visit Suggestions</p> 	<ol style="list-style-type: none"> 1. Refer to Grade 4 Unit 1 Earth/Space Science Guide for lesson seeds and resources to support instruction for weathering and erosion. Students will be able to make stronger observations at the canal if they have had time to investigate with processes that change Earth's surface. 2. If students need refreshed, do a mind map to re-activate their thinking. 3. Visit netTrekker on the youseemore.com WCPS website. Students can use the C&O Canal Trip Grade 4 folder in the portfolio to do research. 4. Contact the WCPS Office of Elementary Education for Science (X8780) for instruction and content assistance.

5 E Model	Time Frame	Activity
<p>Engage</p> 	10 minutes	<ol style="list-style-type: none"> 1. Gather the students at the Town of Williamsport bulletin board next to the Cushwa Basin access road. Point out the flood gauge on the side of the warehouse. 2. Ask: "Why is there a flood gauge on the side of the warehouse?" (to measure flooding height) 3. Walk to the left side of the warehouse to see the flood markings. Discuss how powerful water can be. Share the pictures provided in the binder. Have the students use the pictures to help them think about what changes might have occurred when the canal floods. 4. Introduce the focus question. <ul style="list-style-type: none"> • How do the processes of weathering, erosion, and deposition contribute to the rapid and slow changes along the C&O Canal? Review any important vocabulary from the focus questions. Have the students share what they know about weathering, erosion, and deposition. Remind the students of what they learned in science during unit 1 instruction. <p>Note: Students who have not received science instruction regarding weathering and erosion will most likely have no prior knowledge of the processes that change Earth's surface. See pre-visit suggestions on the previous page for instructional suggestions.</p>
<p>Explore</p> 	30 minutes	<ol style="list-style-type: none"> 5. Tell the students they will be looking for evidence of weathering, erosion, and deposition in different areas along the C&O Canal. First, students will make observations at the basin with the guidance of the teacher. Second, the students will explore independently (with adult supervision) the upstream side of the aqueduct. <p>Guided Exploration</p> <ol style="list-style-type: none"> 5. Have the students make observations about the shoreline of the basin. <p>Ask: "What evidence do you see of weathering?"</p> <p>"What evidence do you see of erosion and deposition?"</p> <p>"Which natural agents do you believe are responsible for weathering, erosion, and deposition in this area?"</p> <p>"Do you believe that the changes have occurred slowly, rapidly, or both? Explain why."</p> <p>"What could we do to control erosion and deposition along the shoreline?"</p> <p>Independent Exploration</p> <ol style="list-style-type: none"> 6. Have the students make observations about the area upstream from the aqueduct. Students are to work independently in small groups with adult supervision. The teacher should visit groups and continue to use probing questions. Encourage the students to record their observations on the map provided on the clipboard. <p>Ask: "What evidence do you see of weathering?"</p> <p>"What evidence do you see of erosion and deposition?"</p> <p>"Which natural agents do you believe are responsible for weathering, erosion, and deposition in this area?"</p> <p>"Do you believe that the changes have occurred slowly, rapidly, or both? Explain why."</p> <p>"What could we do to control erosion and deposition in this area?"</p> <p>4 of 5</p>

<p>Explain</p> 	<p>5 minutes</p>	<p>7. The students gather to share their observations. Use the probing questions to guide the discussion.</p> <p>Ask: "What evidence do you see of weathering?"</p> <p>"What evidence do you see of erosion and deposition?"</p> <p>"Which natural agents do you believe are responsible for weathering, erosion, and deposition in this area?"</p> <p>"Do you believe that the changes have occurred slowly, rapidly, or both? Explain why."</p> <p>"What could we do to control erosion and deposition in this area?"</p>
<p>Evaluate</p> 	<p>5 minutes</p>	<p>8. Revisit focus question.</p> <ul style="list-style-type: none"> How do the processes of weathering, erosion, and deposition contribute to the rapid and slow changes along the C&O Canal? <p>Have the students share their ideas.</p>
<p>Extension Ideas</p> 		<p>Consider the following activities if you have time to fill or are looking for ways to enhance instruction.</p> <ol style="list-style-type: none"> 1. Have the students use the map provided on their clipboard to show ways they could control erosion and deposition. 2. Have the students use a t-chart labeled claims and evidence to record claims and evidence from their observations. 3. Visit the Conococheague Creek Aqueduct and have the students make observations about evidence of weathering. 4. If your school has access, consider taking digital cameras for students to take pictures of their observations. Contact the WCPS Office of Elementary Education for Science (x8780) to check out Flip Cameras. 5. If your school has access, consider taking GPS units for students to plot the points for which they made their observations. Contact the WCPS Office of Elementary Education for Science (x8780) to check out GPS units.
<p>Post Visit Suggestions</p> 		<ol style="list-style-type: none"> 1. Have the students perform the dialogue/play of Captain Myers Bad Day. (provided in this packet) 2. Visit netTrekker on the youseemore.com WCPS website. Students can use the C&O Canal Trip Grade 4 folder in the portfolio to do more research. 3. Have the students create an electronic publication to share their observations and to propose ways for controlling erosion and deposition along the canal.

Focus Question

How do the processes of weathering and erosion contribute to the rapid and slow changes along the C&O Canal?